

**plain talk  
about  
concrete  
floors**



Alat niala  
two  
concrete  
floors



537-3

(1928)

"The serviceability and even the life of a building depends primarily on its floors because they are the part subjected to the greatest wear."

*The Portland Cement  
Association*

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THE MASTER BUILDERS COMPANY  
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2nd Edition, November, 1928

1928-57388 TCF



THE time has come when some plain talking on the subject of Concrete Floors is needed. For more than fifteen years Engineers, Architects, and Builders have been trying to lay concrete floors strong enough to stand up under modern industrial traffic. In spite of their efforts, there are today few, if any, who admit that concrete floors have been anything like a complete success. What is the reason?

That these attempts have been unsuccessful in so large a percentage of instances is not due to any fundamental weakness of concrete flooring as such. Failure to get uniformly good results is due to the attitude of builders toward concrete floors that because they are inexpensive they are "cheap," that they can be made of cheap materials by cheap workmanship. It is just as impossible to obtain a satisfactory, strong concrete floor as it is to obtain a satisfactory product of any kind without building quality into it. Quality cannot be sprinkled on nor brushed on. Like a steel beam, it must be inside and all the way through — *built in*.

Good concrete floors will be obtained generally when builders, as a class, cease to regard floors as one of the first places to start cutting their building costs—when they become convinced that *quality in method, material and workmanship* is a basic requisite, and when they realize that a good concrete floor is rarely, if ever, produced by trying to doctor up a poor or a cheap one.

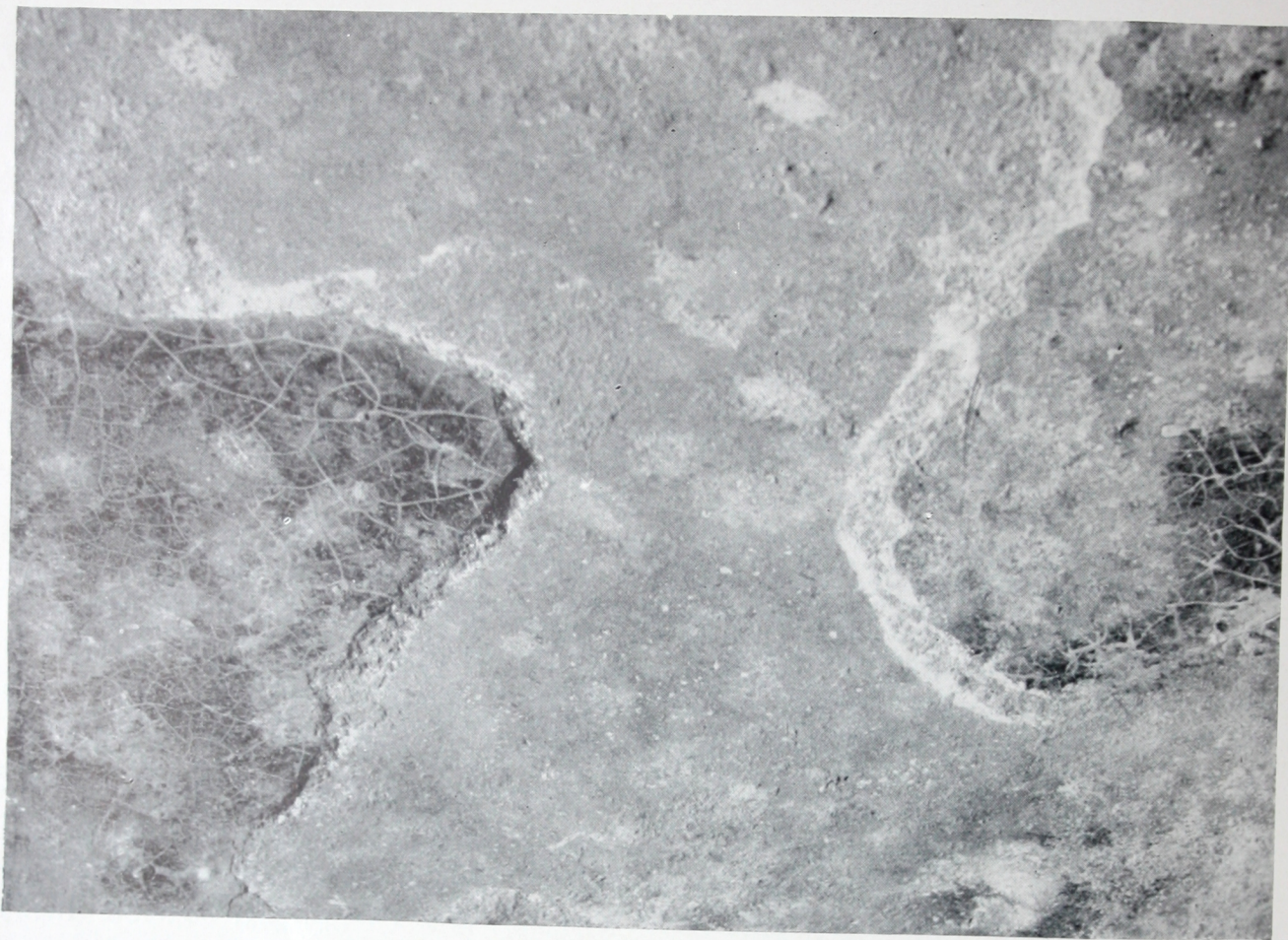
These facts are of utmost importance to building owners and to the construction industry right now. The floor question is an extremely critical one in many businesses and is directly affecting costs and profits.

It is our firm conviction, backed up by almost twenty years of specialized experience in producing better concrete wearing surfaces, that twenty-year concrete floors for industrial traffic can be regularly produced. Scores of such floors, laid in accordance with standardized methods and materials, bear testimony to this statement. The service was built into these floors by definitely known and repeatable methods.

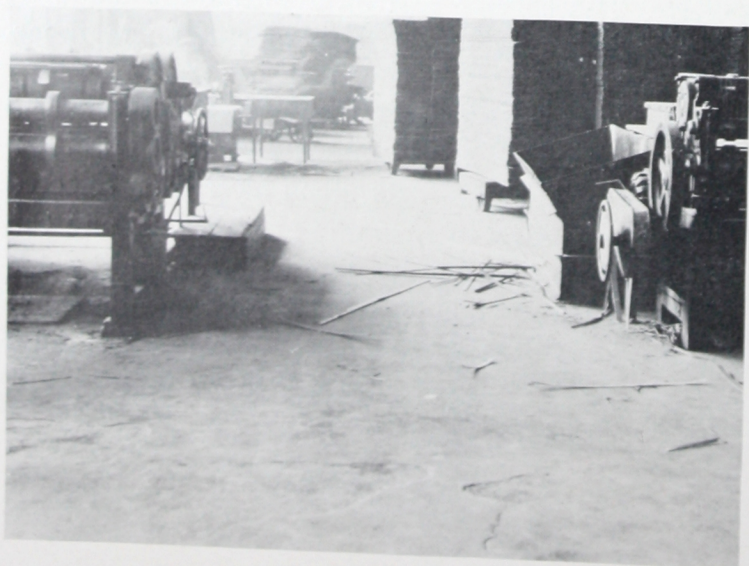
This book contains data collected over a period of nearly twenty years. The illustrations and facts given have been selected as typical of prevailing conditions, and can be supported by hundreds of similar examples. None of the photographs have been retouched. We submit that these facts, easily verifiable, speak conclusively for themselves.

DD 89-67385 TCF





Broken down floor surface in a paper box manufacturing plant. A typical condition on a floor not properly planned or laid to bear the heavy traffic carried. The surface was "hardened" when new by a standard surface treatment, and has been re-treated several times since, without permanent results or stopping the disintegration.



General view including the floor area shown above. This condition, which prevails in thousands of plants interferes with efficient operation, requires constant doctoring, and costs owners through repairs, interruptions and retarded operations, far more than they would have paid in the beginning for the type of concrete floor their business requires.





The beginning of the end of a floor in a spring manufacturing plant. Treated when new with a standard surface hardener of the magnesium fluosilicate type. Brittle finish is breaking away, exposing coarse aggregate which has little wearing value. The owner's business demands a super floor. He will pay for such a floor — and more — in paying for the repeated patching of this one.

Dripping water did this to the plain cement floor in a railway station at a point where the floor gets no traffic. On plain floors subject to both moisture and traffic disintegration is rapid. Moisture does no damage to a floor that has been prepared for it.

Contrast these conditions with floors in plants pictured on page 19.





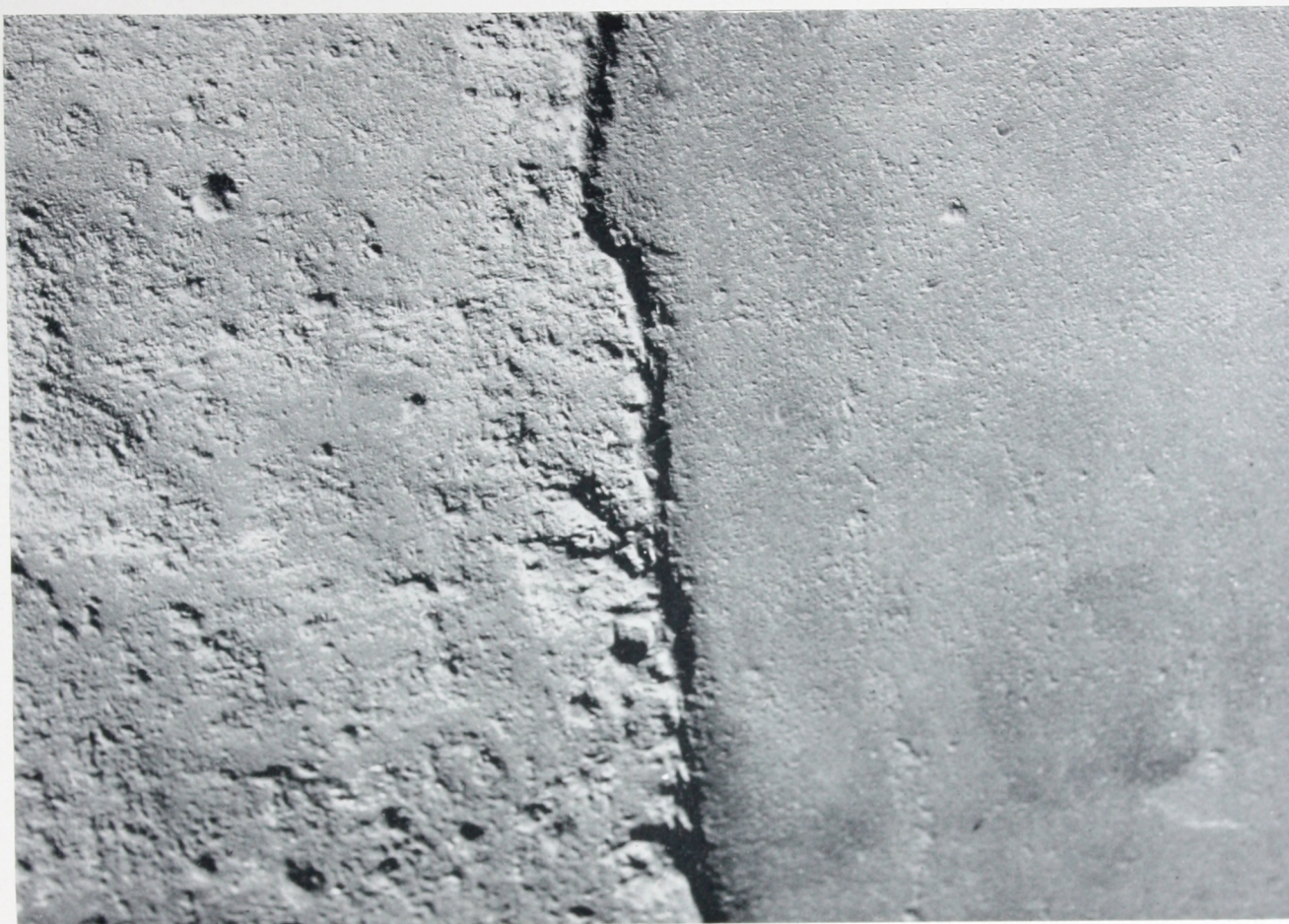


See the difference! Floor at right was laid with pure water absorbent Metallic Hardner; the other half is an ordinary cement floor. These two floors join in the trucking aisle pictured below and have borne the same volume of traffic for over seven years.



Trucking aisle in the Cincinnati plant of the American Blower Company. Note practically perfect condition of the Metallic Hardened surface in the foreground and the heavy nature of the traffic it bears. The floor in the background is of ordinary concrete.





Which of these is the low-cost floor? A Metallic Hardened floor (right) and a plain cement floor (left) treated with a surface hardener, join in the doorway pictured below. The Metallic floor after 12 years of service is practically perfect; the surface treated floor with only 8 years' wear is being replaced (1928).

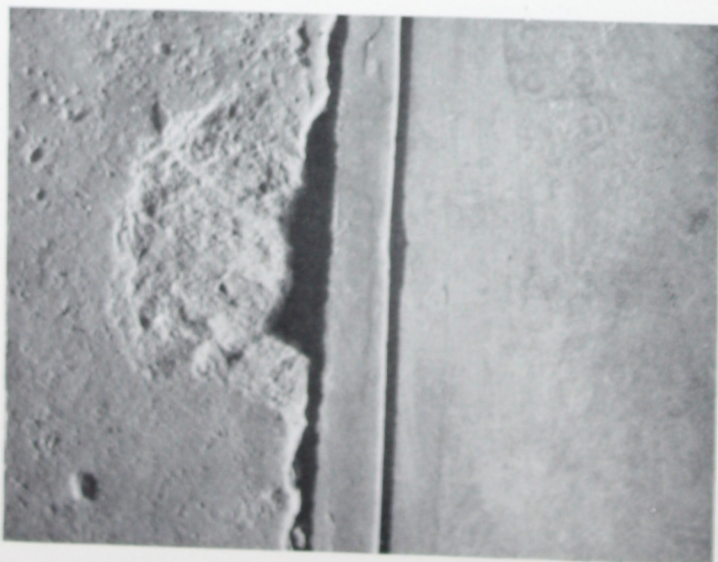
Shipping Department, Richman Bros. Co., Cleveland. In this plant, which was erected in 1916, Master Builders Metallic Hardened Floors are installed. Estimating from his previous experience with plain floors, this owner states that reduced maintenance expense since 1916 has paid for the Metallic Hardner three times over.







Pennsylvania Railroad Station, Euclid Avenue and East 55th St., Cleveland, erected 1912. The floor in foreground laid with plain cement; the floor shown in background is hardened with Master Builders Metallic Hardner. The hardened area is subject to twice the amount of traffic of the unhardened area. Note comparative condition after 16 years of foot traffic.



Close-up view of joint showing relative condition of the plain and Metallic Hardened floors in the above corridor. The Pennsylvania Railroad Company is, and has been an extensive user of Metallic Hardner for freight stations, passenger stations, shops, and other heavy-duty areas.



# Is There a Proven Remedy for These Conditions?

Can concrete surfaces be laid that will last for 20 years under modern industrial traffic conditions? How? What proof is there that they can be laid? Are they available anywhere and at practical cost?

To answer this it is necessary to review briefly methods that have been in use during the past two decades to improve the wearing quality of plain cement finishes.

## Metallic Hardner-Integral

In 1910 the idea of hardening concrete wearing surfaces was developed, and the use of metal as an aggregate for that purpose introduced. Announced first as Metallic Aggregate, it later on became known as Metallic Concrete Hardner. This new material was used in accordance with the integral principle. In other words, put into the floor when it was built. Metallic Hardner is floated and troweled into the finish of the cement floor when it is laid and exact specifications, which govern quantities and qualities of materials and method of workmanship, control the installation of the top finish from start to completion. The quality and strength are put into the floor when it is built. From the date of its introduction, the integral method has had strong advocates and a large number of Metallic Hardened floors have been installed in buildings of practically all types.

## Liquid Hardener-Integral

In 1916 another integral method was perfected by which a liquid chemical added to the mixing water produced concrete of increased density, harder and waterproof. Although less resistant to wear than the Metallic Hardened floor, this surface is dustproof and non-absorbent and suitable for office and commercial buildings, loft and light manufacturing purposes. Here again the Hardener, added during installation, is made part of the floor; the strength

and density are built in throughout the thickness of the wearing course. This type of integral floor hardener is represented by Master Builders Master Mix.

## Surface Treatments

From the beginning there was not only a need for improving new floors, but a demand for some remedy for floors that were already in and were dusting and wearing out. To meet this need there came surface treatments, chief of which is magnesium fluosilicate type, familiar to most builders and owners. This is a superficial application made after the concrete surface is installed and cured. Being a liquid wash, effective only on the top fractional inch of the wearing course, and incapable of effective penetration to any practical extent on even an ordinary finish, it is necessarily a temporary measure. It exerts no control whatsoever over the materials or workmanship that go into the floor. Although its real function is dustproofing of surfaces already down, it is frequently specified for new floors under the *baseless assumption* that it enables them to bear heavy traffic indefinitely.

Thousands of floors of the integral type have been laid. Thousands of ordinary concrete floors have been treated with surface hardeners. It is timely and logical, therefore, to investigate the quality of the work each has done, to determine by investigation of actual installations what they look like after years of wear, to find out by a survey of users of both kinds how their service records compare.



# 412 Plant Owners and Engineers Answered the Question

## "What Has Been Your Experience With Floor Hardeners?"

This letter, sent to the engineers and owners of 2250 leading American industrial concerns, requesting a report of their experience with concrete floor hardeners. 412 replied. A summary of their replies follows.



H. P. GOULD COMPANY  
58 E. WASHINGTON ST.  
CHICAGO

Winchester Repeating Arms Co.,  
New Haven, Conn.

Attention: Mr. Neil P. McDonald  
Supt. of Maintenance & Power

Gentlemen:

We have been retained by a client interested in concrete floor construction to make an investigation of various types of treatments for hardening concrete floors.

Concrete floor treatments fall roughly into two classes: (1) Materials incorporated in the cement when it is laid known as Integral treatments, and (2) Chemical treatments applied to the surface of the cement floor after it has been laid.

We will appreciate your help greatly if you will check on the attached sheet the answer to the questions asked, which will give us the benefit of your knowledge and experience with treatments of this kind.

You will very likely be interested in this subject yourself and should you care to have a copy of the final report of this investigation for your own information, we shall be glad to send you one upon request.

Thank you for any assistance you may give us in compiling this report.

Yours very truly,  
H. P. GOULD COMPANY

*Helen Gould*

Secretary-Treasurer

HG:B

### They were asked—

Have you installed or operated on *hardened concrete floors*?

If so, has it been your experience that *hardened concrete floors* are, as a general rule, sufficiently more efficient and longer lived to warrant the additional cost of the hardening treatment?

Is it your experience or judgment that a floor, into which the hardener is incorporated, *when the floor is laid*, is longer lived than one treated with a surface treatment?

With reference to your experience with *floors hardened with Integral Hardener*, over what period of time have these treatments seemed to be effective?

1 year **11** 2 years **8** 3 years **11** 4 years **5** 5 years **23**  
6 years **7** 7 years **3** 8 years **5** 9 years **1½** 10 years **58½**

129 Owners answered this question. Eleven said, "1 year;" Eight said, "2 years," etc., as indicated by numerals set in bold type in the list above.

With reference to your experience with floors treated with *Surface Applications*, over what period of time have these treatments seemed to be effective?

1 year **31** 2 years **19** 3 years **25** 4 years **9** 5 years **31**  
6 years **5** 7 years **4** 8 years **3½** 9 years **1½** 10 years **17**

145 Owners answered this question. Thirty-one said, "1 year;" Nineteen said "2 years," etc., as indicated by numerals set in bold type in the list above.

### They answered—

257 said YES  
155 said NO

202 said YES  
36 said NO

110 said YES  
21 said NO

45.3% said 10 years  
or over  
27.5% said 5 to 9 years  
27.1% said 1 to 4 years

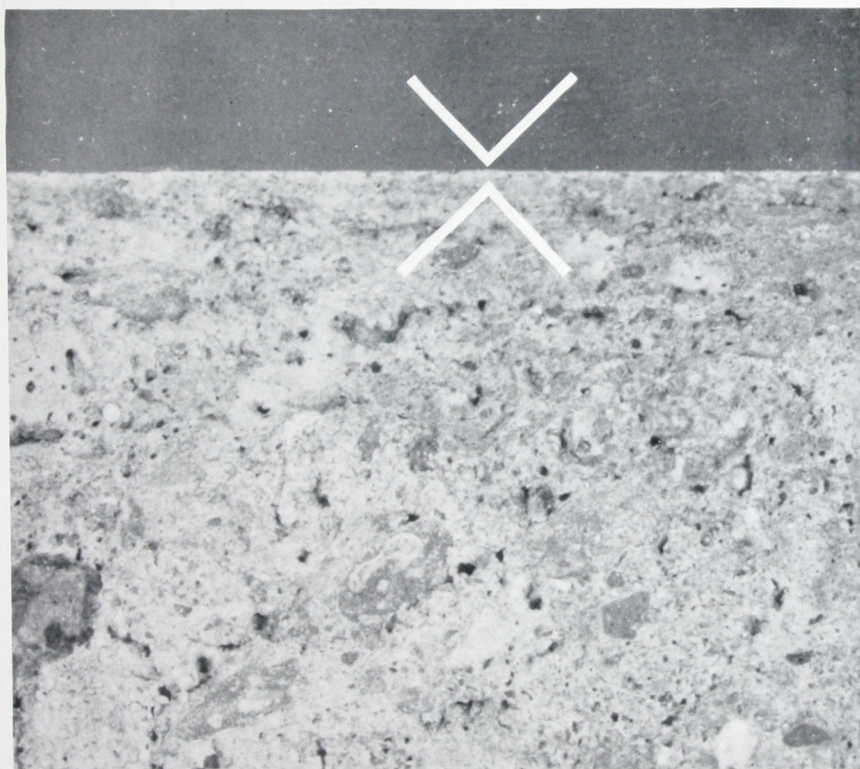
11.7% said 10 years  
or over  
30.3% said 5 to 9 years  
58.0% said 1 to 4 years



# Is Surface Treatment a Permanent Remedy?

Foreword—The Master Builders Company manufactures Saniseal, one of the leading brands of surface treatment of the kind described below. This type of hardener has definite, valuable functions. But that its specifications for new floors which are to carry industrial traffic is not justified, either economically or structurally, is proved by the following evidence.

## What a Surface Treatment Does



### Penetrates 1/48 of an Inch

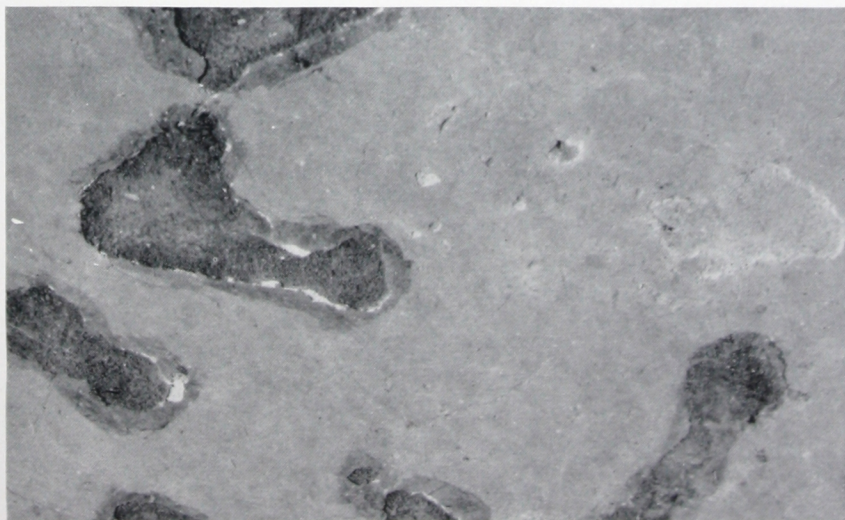
A one-inch cement wearing surface, treated with a standard brand of magnesium fluosilicate surface hardener, which was tinted to show the depth of penetration. The slab was broken and this cross-section photographed, *enlarged three and one-half times*. The thin white line at the surface shows depth of penetration to be approximately 1/48".

643

To see effect of abrasion on surface-treated concrete, see page 25.

### When Tested By Actual Wear

Typical area of a surface-treated cement floor (approximately 6 square feet) in a clothing manufacturing plant, showing how traffic breaks through the thin, brittle finish, necessitating constant repair. Holes coated with an asphalt paint to reduce dusting.

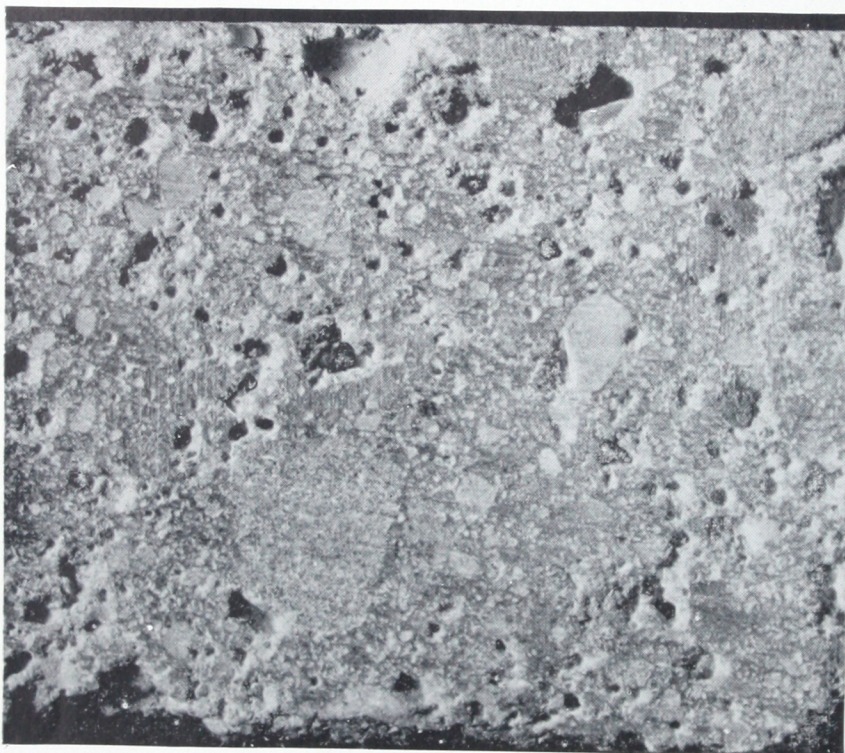




# Is Integral Liquid Hardener A Permanent Remedy?

Master Mix is added to the mixing water with which the cement and sand mortar are gauged, and so reaches all parts of the mix. The hardening and waterproofing, *put in when the floor is laid*, is effective throughout the full thickness of the wearing course.

## What Master Mix Does



### Hardens The Full Topping

Cross Section (enlarged three and one-half times) of a Master Mix hardened slab. Note unusual density of the cement extending throughout the entire thickness.

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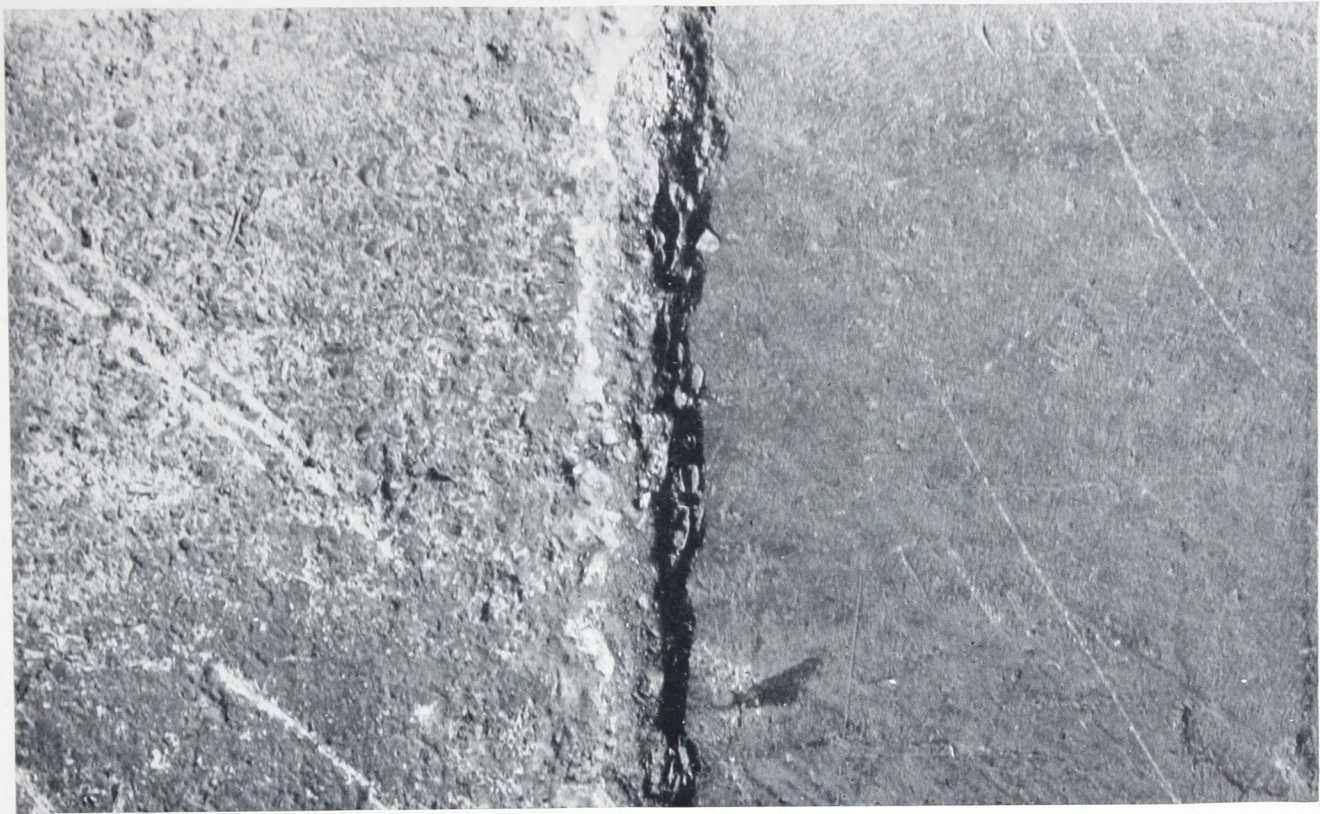
To see effect of abrasion on Master Mix hardened floor, see page 25.

### When Tested by Actual Wear

Close-up of area (approximately 8 sq. ft.) of Master Mix hardened floor in U. S. Naval Base Warehouse, Brooklyn, N.Y., after 11 years of daily use.

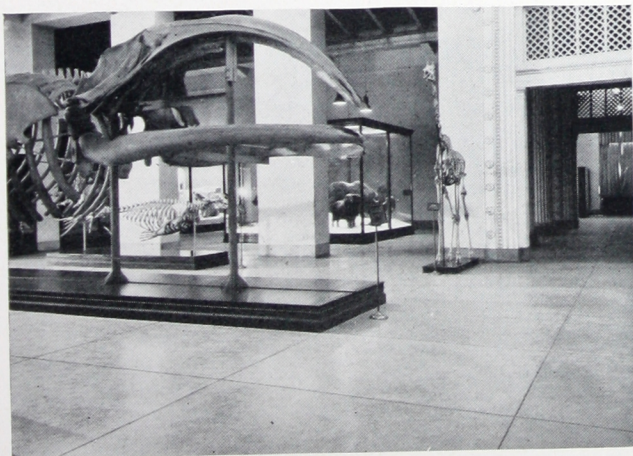






In the Olympia Sports Arena, Detroit, a Master Mix hardened floor (right) and an ordinary concrete floor join. Note comparative condition of the two surfaces after an equal period of foot traffic.

## Eight-Year Test In Art Museum



The Field Museum, Chicago, has approximately a million square feet of concrete floor laid in the winter of 1918-1919, and hardened and waterproofed throughout with Master Mix. After nearly 10 years of daily foot traffic the floor surfaces are practically as sound as when new. Photographed 1928.

Below is a close-up view of a typical area of the floor shown in the illustration at left. Note its perfect condition after nearly a decade of daily use. Photographed 1928.



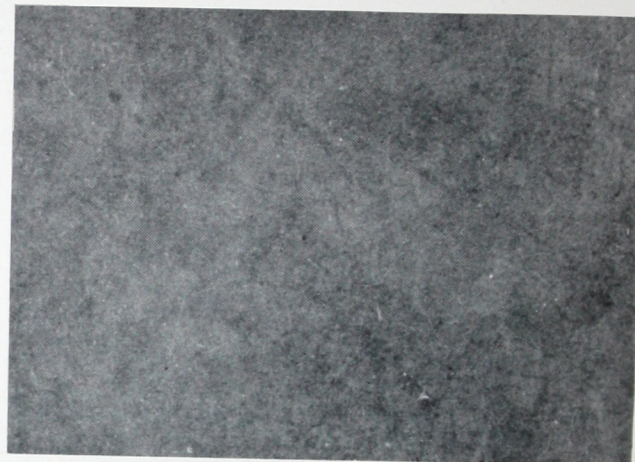


## Six-Year Test On a School Corridor

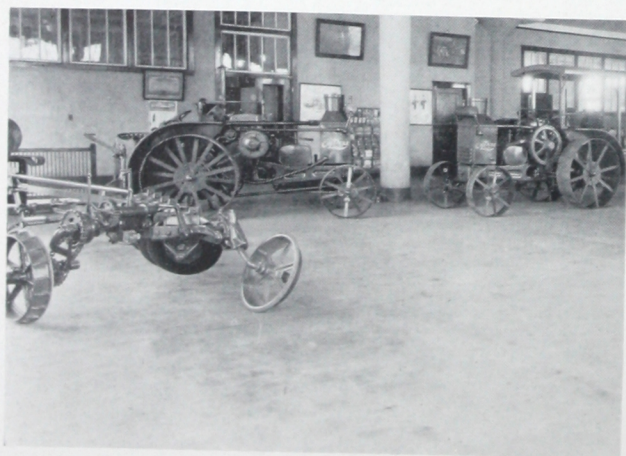


The Master Mix hardened floor on this Wichita, Kansas, High School corridor has had typical school traffic since 1923. Its present condition is practically perfect. Photographed 1928.

Close-up picture of a representative area of the Master Mix floor on the above corridor. Photographed 1928.



## Eight-Year Test In a Sales Room



The Advance-Rumley Company, laid this Master Mix hardened floor in 1920 in their Dallas sales and show room. This photograph taken in 1927.

A close-up view of a typical area, approximately six square feet, in the Advance-Rumley Sales Room, shown above. Photographed 1927.

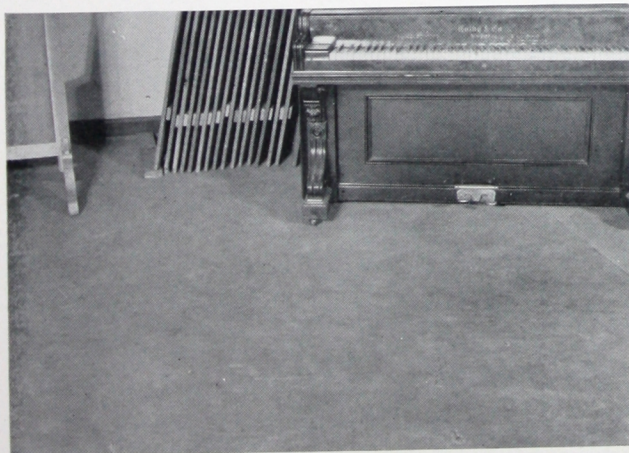




# How to Identify a Genuine Integral Liquid Hardener and Waterproofer

MUCH confusion has resulted from the claims of certain manufacturers that because their products contained calcium chloride, with its well-known accelerating properties, they were the same as Master Mix Integral Liquid Hardener which hitherto has also contained among other ingredients a *rectified calcium chloride*. Nothing could be further from the truth than such claims. Whereas these so-called, "just as good products" are usually straight calcium chloride, Master Mix Integral Hardner has contained this element as a purely incidental constituent of its composition. The hardening and waterproofing values of Master Mix are accomplished through very definite elements combined in the manufacture of this product, and have not been related to nor dependent on the calcium chloride element.

Since June 1st, 1928, Master Mix has contained no calcium chloride whatsoever, thus removing the last vestige of similarity between it and cheap substitutes. This fact enables the buyer to make a very simple and conclusive test of "just as good" claims by submitting such material to any laboratory for comparative test.



This Master Mix hardened floor in St. Lukes Church, Minneapolis, has been in use since 1922. On concrete floors in churches and schools dustproof, waterproof finishes are essential. Photographed 1928.



The Worthington Pump & Machinery Company installed this Master Mix floor in their pattern store room in 1918. Note the perfect condition after 10 years. Photographed 1928.



# Is the Metallic Hardner Method the Permanent Remedy?

Metallic Hardner is an aggregate used in place of sand in the top portion of the wearing finish—and is installed integrally when the floor is laid.

## What Metallic Hardner Does



### Gives Floor $\frac{1}{8}$ -inch "Armor"

Enlarged Cross section of Metallic hardened slab. 1-inch thick, showing the Metallic Hardener imbedded at the point of wear to a depth of nearly  $\frac{1}{8}$ -inch. Brittle sand is replaced by the tough, ductile metallic aggregate, which produces a non-porous, dustproof surface of maximum wear resistance.

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To see effect of abrasion on a metallic-hardened surface, see page 24.

### When Tested by Actual Wear

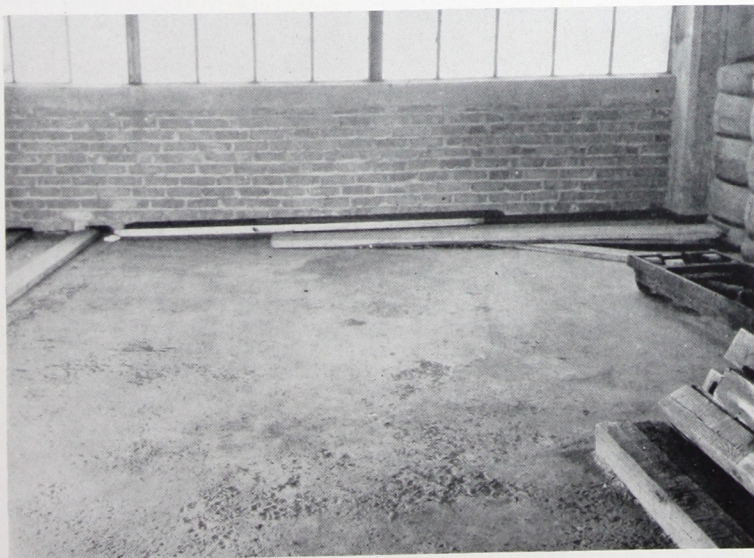
Typical area of Metallic Hardened floor in Shipping Department, Richman Bros. Co. Plant, after 12 years' daily traffic. See report on low operating and maintenance cost of this floor on page 18.







**BUT**—not every metallic hardener will produce good floors. The owner of this warehouse floor was seeking better than ordinary results; he had heard of Metallic Hardened concrete floors and decided to have them. But he was told by the contractor that all metallic hardeners were alike, so purchased on a price basis, disregarding quality. The scaling, due to impurities in the hardener used, has pitted the floor so that traffic will pound the finish out in a few months.



Metallic Hardner is an aggregate used in place of sand in the top portion of the wearing finish. Aggregates, whether sand or metal, must be selected with care. Metallic Hardner, like sand, must be of the proper grading in size, free from organic matter, oils, greases, non-ferrous metals and other impurities that will disintegrate the concrete instead of hardening it. To mix readily with a minimum of troweling and insure maximum bonding strength *metallic hardner must be water absorbent.*



# Users of the Metallic Method Say—

The following reports were given by owners of Metallic Hardened Floors to independent investigators of the H. P. Gould Company, Chicago.

## Northwestern Terra Cotta Company Says, “Only \$15 Repairs in 14 Years on Floor Carrying Heavy Traffic”



This photograph taken in Chicago plant of Northwestern Terra Cotta Co., in 1927, shows practically perfect condition of Metallic Hardened Floor installed in trucking aisle in 1913.



Joint where Metallic Hardened floor (top) and plain cement floor (bottom) meet in Northwestern Terra Cotta plant. After equal usage, note greater extent of wear on the plain surface.



### Metallic Hardner Flooring Pays for Itself Every 3 Years by Saving in Repairs

*By D. F. Albery, Asst. Superintendent, and Jos. Gregori,  
in charge of Maintenance*

When Building No. 1 was constructed in 1911, we used plain concrete floors throughout a second floor aisleway, which is subject to the constant trucking of terra cotta with hand platform trucks loaded up to 900 pounds.

#### **Hardner Costs Only 3c per Sq. Ft. More**

This severe service wore out the concrete floors so that they required patching every 6 months. To remedy the inconvenience, we decided in 1913 to try the Metallic Hardner made by Master Builders Company.

We resurfaced the aisleway with Masterbuilt Metallic Hardner at a cost of only 3c per sq. ft. more (than ordinary cement) or a total cost of \$871.20 for the job.

#### **Pays for Itself Five Times Over in 14 Years**

That surface is still in good condition after 14 years in spite of an increasing volume of traffic. Except for a few minor patching jobs at the joints, which cost not over \$15.00 for the 14 years, the Metallic Hardner aisleway has caused no maintenance expense or delay in traffic. It is nearly as smooth today as the day it was laid.

If we had kept our old concrete floor, which required some resurfacing twice a year, we figure that the necessary patching would have cost us at least \$15.00 each time, or \$420.00 during the 14-year period. This saving of \$405.00 in 14 years has paid for the Metallic Hardner five times over.

#### **Floor Still Smooth After Seven Years' Use**

With this experience, it was only natural that we should lay Masterbuilt Metallic Hardner floors in our Buildings No. 27 and No. 28 when they were erected in 1920. This floor is approximately 460 x 100 ft. and over it both hand and electric trucking are constantly carried on.

In Seven years' service we have not spent \$10.00 in repairs on these Metallic Hardner floors, and the surface is perfectly smooth.

We have every reason to believe that the floors will last many years more. This means that depreciation on Metallic Hardner floors is a negligible item.



# American Signs Corporation Says—

## *This is To Certify—*

that the owners of these installations have revised, corrected and O.K.'d these reports and granted to our client the right to their unrestricted use in all educational, sales and advertising work in promoting the more efficient and economical use of the equipment and service mentioned.

We keep the written O.K. on the work sheets in our files.

Securing this authorization for open sales use of such vital data is the greatest obstacle we have to overcome, and represents one of the greatest advantages in our service.

H. P. Gould Company, Chicago.



## "14 Years' Heavy Trucking has no Effect on Metallic Hardened Floors"

Small Additional Cost Well Repaid by Freedom from Patching and Traffic Delays

By A. MARK SMITH

Sales Manager, American Signs Corporation,  
Kalamazoo, Mich.

When our present plant was constructed in 1913, concrete and wood floors were installed throughout except in our ground floor trucking aisles, which were treated with Metallic Hardner, manufactured by the Master Builders Company.

### ***Metallic Hardner Protects "Heart of Factory"***

These aislesways are really the heart of our factory, because both incoming material and outward bound products are moved over them. They are subject to the constant trucking of coal, steel plates and shapes, finished signs, etc., and trucks moving over them are often loaded up to 5 tons.

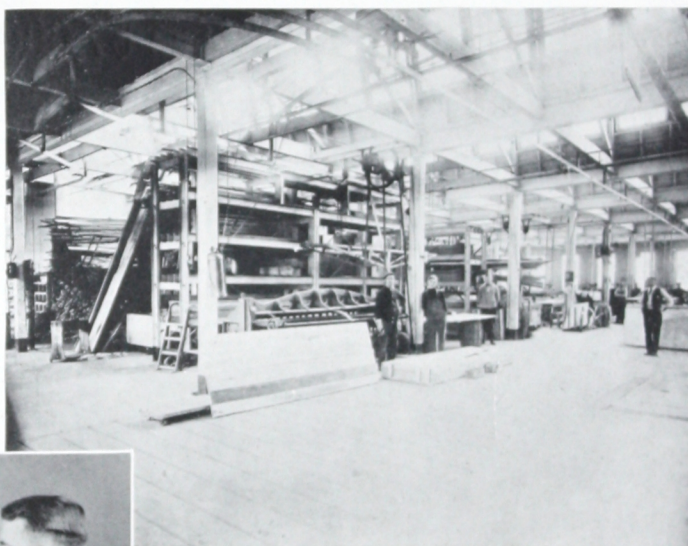
Although these two strips of floor are subjected to this severe service, they have shown no signs of wear in 14 years, and have never been touched for patching or repair.

### ***Only 4c per Sq. Ft. Extra for Durability***

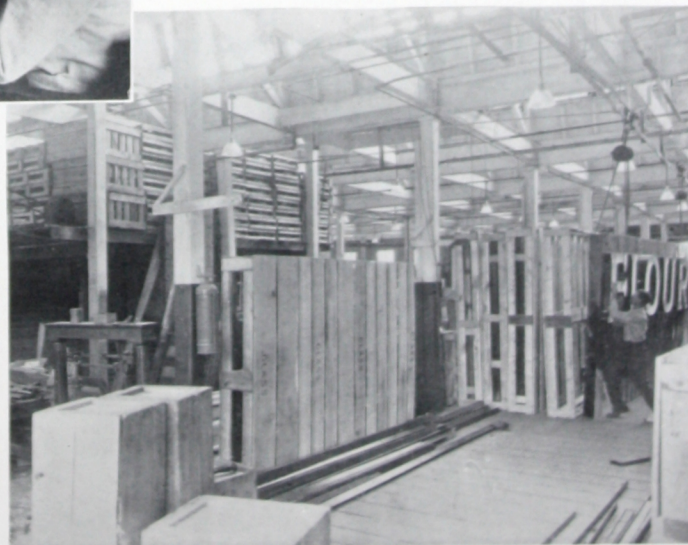
The added cost of these Metallic Hardner floors was only about four cents per sq. ft., including materials and labor.

This amount has been returned to us several times over in freedom from patching and resurfacing expense and by eliminating the traffic delays that undoubtedly would have resulted if an ordinary concrete floor had been laid.

The Masterbuilt floors are in as good condition as the day they were laid, 14 years ago.



Trucking aisle as photographed in 1913. The young man leaning against column in center of above picture is Mr. B. C. Wilson, now Vice-President and General Manager. Recent photograph of Mr. Wilson at left.



Photograph of the same area taken in 1927, shows heavy usage this floor has had.



# The Richman Brothers Co., Cleveland, Says —

## *This is to Certify —*

that the owner of this installation has revised, corrected and O.K.'d this report and granted to our client the right to its unrestricted use in all educational, sales and advertising work in promoting the more efficient and economical use of the equipment and service mentioned.

We keep the written O.K. on the work sheets in our files.

Securing this authorization for open sales use of such vital data is the greatest obstacle we have to overcome, and represents one of the greatest advantages in our service.

H. P. Gould Company, Chicago.

## "Masterbuilt Floors Save \$7,000 in 11 Years' Hard Service"



Shipping Department, Richman Bros'. plant. Eleven years traffic has resulted in no perceptible wear.



Close-up view of typical area of floor shown in above illustration, after 11 years of wear.



### Comparative Wear Under Same Conditions Proves Their Superiority

#### *11 Years' Use With One Minor Repair*

In 1916, after investigating all kinds and methods of floor building, we laid a third of our total floor space — or over 100,000 sq. ft. — with Masterbuilt floor, using Master Builders Metallic Hardner. The Metallic Hardner, together with the cost of applying it, added about 2½ cents per square foot, or a total of \$2500.00, to the cost of the floor.

These floors have stood 11 years' use with only one repair. This cost about 20 cents a square foot, including the labor of chipping out the old floor, or \$180.00 for the job.

#### *Surface Treated Floor Badly Worn*

In 1920 we made certain minor additions. Some of these floors, including a shipping platform, were not hardened with Metallic Hardner, but with a surface treatment.

Though four years newer than the Masterbuilt floors, the shipping platform has worn so badly that, if we were not planning soon to do away with this particular platform, it would have to be entirely replaced. The shipping platform and the Masterbuilt floor are subject to the same constant heavy trucking.

#### *Masterbuilt Floors Soon Pay for Themselves*

Judging by this comparison, if our present Masterbuilt floors had been laid in the same manner as the shipping platform, at least 50 per cent of them would have required repairs or replacement by this time. At a cost of 20 cents a square foot, replacing 50,000 sq. ft. would cost \$10,000.00.

Instead of paying out this amount, however, we have spent the original cost of the Metallic Hardner plus the cost of one small repair job — a total of \$2680.00. This gives us a saving of over \$7000.00 on our floors, which has paid for the Metallic Hardner almost three times in the 11 years it has been in use.

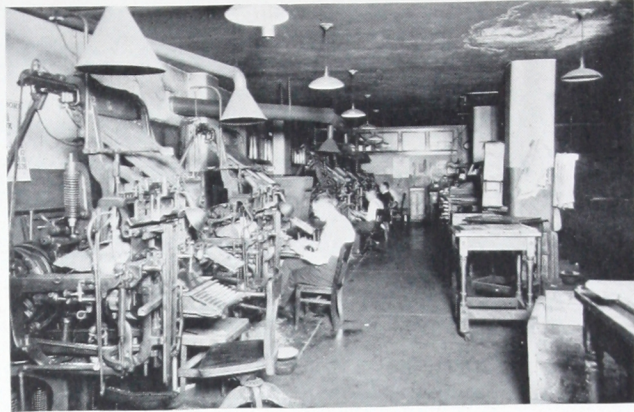
Our Masterbuilt floors are still in excellent condition, and are good for many more years' service. Barring accidents, we estimate that they will last as long as the building itself.



## Fifteen-Year Test in a Printing Plant



Masterbuilt Metallic Hardened floor laid for Boyce Publishing Co., Chicago, in 1913, photographed in 1914.



Same floor as shown in the illustration at the left, photographed 1928. Condition practically perfect.

## Fifteen-Year Test in a Candy Factory



Masterbuilt Metallic Hardened floor laid for The Auerbach Candy Co., N. Y., in 1913, photographed in 1914.

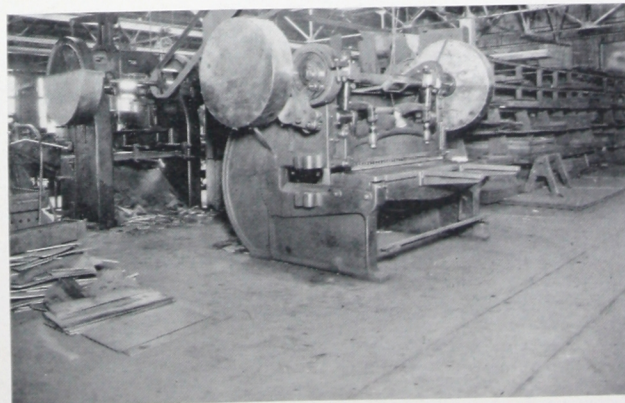


Same floor as shown in the illustration at the left, photographed in 1928. No upkeep expense in 15 years.

## Fifteen-Year Test in Office Building and Machine Shop



Architects Building, New York, Masterbuilt Metallic Hardened floor installed throughout, in 1913. This floor in building manager's office photographed in 1928.



Masterbuilt Metallic floor laid in 1913 for Koehring Machine Co., Milwaukee, photographed in 1928.



# Official Laboratory Tests Show

## Increased Compression Strength

*Question*—"What is the most common measure by which the quality of concrete is judged?"

*Answer*—"Compressive Strength." From CONCRETE PRIMER by F. R. McMillan, Director of Research, The Portland Cement Association.

NEW YORK  
53 PARK PLACE  
PITTSBURGH  
MONON BANK BLDG  
ST LOUIS  
SYNDICATE TRUST BLDG  
SAN FRANCISCO  
251 KEARNY ST  
LONDON  
34 40 LUDGATE HILL E.C. 4  
MONTREAL  
1001 MC GILL BLDG

### ROBERT W. HUNT COMPANY, ENGINEERS.

#### INSPECTION, TESTS & CONSULTATION

GENERAL OFFICES "2200 INSURANCE EXCHANGE" CHICAGO.

CABLE ADDRESS "ROBHUNT"

JNO. J. CONE,  
PRESIDENT

D. W. MC NAUGHER,  
VICE PRES. & TREAS.

C. B. NOLTE,  
VICE PRES. & GEN'L MGR.

PITTSBURGH, PA. Aug. 31, 1926.  
MONONGAHELA BANK BLDG.

IN REPLY REFER TO

Phys. Lab. #14071.

The Master Builders Company,  
Cleveland, Ohio.

Gentlemen:-

The following is our report of compression test results obtained for a series of two inch cubes made of cement mortar in accordance with your order No. 12059.

### Results — Hunt Tests On Compression Strength

| Period  | Master Builders<br>Metallic Hardner<br>(2-inch cubes) | Plain<br>1:2 Cement<br>(2-inch cubes) | Master Builders<br>Master Mix<br>(2x4-inch cubes) | Plain<br>1:2 Cement<br>(2x4-inch cubes) |
|---------|-------------------------------------------------------|---------------------------------------|---------------------------------------------------|-----------------------------------------|
|         | Pounds per square<br>inch                             | Pounds per square<br>inch             | Pounds per square<br>inch                         | Pounds per square<br>inch               |
| 3 days  | 6,927                                                 | 3,274                                 | 4,051                                             | 2,950                                   |
| 7 days  | 8,695                                                 | 3,626                                 | 4,066                                             | 3,670                                   |
| 28 days | 13,245                                                | 6,129                                 | 4,806                                             | 4,261                                   |
| 90 days | 14,302                                                | 6,583                                 | 7,046                                             | 6,265                                   |

Respectfully submitted,

*Robert W. Hunt Company*

Per - *J. H. Morgan*



# Increased Wear Resistance

Upon recommendation of the Portland Cement Association, the Engineering Experiment Station, Ohio State University, Columbus, Ohio, was engaged to make the following tests.

## Abrasion Tests of Hardened Concrete

Following is the condensed report of tests made in the Engineering Experiment Station Laboratory at Ohio State University, to demonstrate the relative resistance to abrasion of concrete slabs, hardened by the use of various types and various brands of concrete floor hardening treatments and materials.

The hardened slabs tested were treated with the following materials:

1. Pure, water-absorbent Metallic Concrete Hardener
2. Impure water-repellent Metallic Concrete Hardener
3. Integral liquid hardener (3 brands)
4. Plain Calcium Chloride solution
5. Surface Treatment Hardener (3 brands)

The unhardened slabs tested included:

1. Plain Portland Cement slabs (1 cement—2 sand)
2. Slabs made to the Kalman specification

The slabs used in making these tests (except the four made to the Kalman specification) were made by operator Edward Kaufman in the Laboratories of the Engineering Experiment Station, Ohio State University, Columbus, Ohio, under the observation of the writer. The slabs were made in wooden forms constructed of pine boards and were 15"x15"x1". The mortar mix was composed of two parts sand and one part Portland Cement.

The sand used was washed Canadian sand of the following grading:

|                          |          |
|--------------------------|----------|
| Retained on No. 10 sieve | = 22.5%  |
| " " " 20 "               | = 27.8%  |
| " " " 30 "               | = 16.8%  |
| " " " 40 "               | = 11.8%  |
| " " " 50 "               | = 11.0%  |
| " " " 60 "               | = 5.1%   |
| " " " 80 "               | = 2.4%   |
| " " " 100 "              | = 1.5%   |
| Passing " " 100 "        | = 1.0%   |
| <hr/>                    |          |
| Total                    | = 100.0% |

The cement was Medusa Brand, meeting all the requirements of the American Society for Testing Materials specifications

for Portland Cement. The tensile strength is as follows:

|        |                                    |
|--------|------------------------------------|
| 7 day  | 270 - 280 - 290 - 270 - Ave. = 280 |
| 28 day | 390 - 410 - 350 - 400 - Ave. = 388 |

The predetermined weight of sand and cement was wet with a measured amount of water to give the proper consistency, and thoroughly mixed on a non-absorbing surface. Each slab was made from a separate mix in which exactly the same weight of cement, sand, and water were used. Each slab was made in exactly the same manner.

The application of the metallic hardeners was according to the specifications furnished by The Master Builders Company. The Metallic Hardener was mixed dry with cement and dusted over the surface of the wet slab, in the proportion of 30 lbs. of Metallic Hardener per 100 sq. ft.

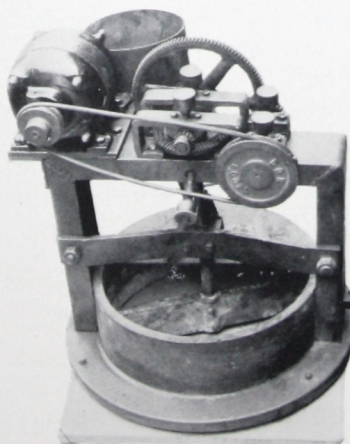
The integral liquid hardeners were added to the water according to the specifications of the manufacturers, furnished by The Master Builders Company.

They were in every case (including the calcium chloride solution) added to the mixing water in the proportions of 1 quart of admixture per bag (96 lbs.) of cement treated.

The liquid surface hardeners were applied when the slabs were 28 days old and in accordance with the specifications furnished by their respective manufacturers.

The slabs were removed from the molds 24 hours after they were made and placed under water (temperature 60 to 70°F.) for 21 days. They were then removed from the water and air-dried for 7 days before abrasion tests were made.

The slabs made according to the Kalman specifica-



*Abrasion machine standing on one of the slabs tested*



tions were furnished by The Master Builders Company.

A resistance-to-wear or abrasion test was made on each separate slab as follows:

Inside of a circular, metallic guide casting (diameter 11 inches) an inverted T-shaped paddle was revolved by a small motor with back gearing at a uniform rate of 37 revolutions per minute. Ahead and against each arm of the T were placed three iron cubes laid in a straight line resting of their own weight against the slab. The cubes are  $1\frac{1}{2}$  inch square with an average weight of one pound per cube. Standard Ottawa Sand (20-30 size) was fed at a uniform rate onto the surface of the slab, over which the iron cubes traveled, to furnish the abrasive medium. This abrasive action was continued for six hours on each slab, after which they were removed, washed free of dust, and air-dried.

To determine quantitatively the wear resistance of the slabs, micrometer measurements were made as follows:

A straight steel bridge bar with 25 gauge holes was laid over the surface of the slab with each end

resting on a small block of steel of uniform thickness, and the exact position of the blocks and bridge marked. Measurements were then taken with a micrometer depth gauge at ten points on the bridge bar and at six different positions on the slab. The measurements were taken running from the inside edge of worn area to outside edge. After the six-hour abrasion test the bridge bar and blocks were replaced in their same relative positions on the slab, and measurements again taken at the same ten points in the six different positions.

The difference between the measurements taken before and after the abrasion test at each point is shown on the data sheets and expressed in thousandths of an inch. The average of the sixty measurements taken on each slab expresses quantitatively the resistance to wear of the slabs, and is also expressed in thousandths of an inch.

By this system of measuring it is evident that the slabs whose surfaces have the greatest resistance to wear would show a less average depth loss in thousandths of an inch than the softer surfaces of other slabs, all other conditions being equal. All these abrasion tests were conducted when the slabs were 28 days old.

## Summary of Results

| A. METALLIC HARDENER                          |                      | Depth of Wear |        |
|-----------------------------------------------|----------------------|---------------|--------|
| (a) Pure, Water-absorbent Metallic Hardener*  | (average of 3 slabs) | = .00232      | inches |
| (b) Impure Water Repellent, Metallic Hardener | (average of 2 slabs) | = .00366      | "      |
| B. INTEGRAL LIQUID HARDENER                   |                      |               |        |
| (a) Brand "A"                                 | (average of 3 slabs) | —.00389**     |        |
| (b) Brand "B"                                 | (1 slab)             | = .00396      |        |
| (c) Brand "C"                                 | (1 slab)             | = .00603      |        |
|                                               | (average of 5 slabs) | = .00463      | "      |
| C. CALCIUM CHLORIDE                           |                      |               |        |
| (a) Slabs made with plain Calcium Chloride    | (average of 2 slabs) | = .00575      | "      |
| D. SURFACE TREATMENT                          |                      |               |        |
| (a) Brand "A"                                 |                      | = .00568      |        |
| (b) Brand "B"                                 |                      | = .00603      |        |
| (c) Brand "C"                                 |                      | = .00374      |        |
|                                               | (average of 3 slabs) | = .00515      | "      |
| E. PLAIN SLABS, UNHARDENED                    |                      |               |        |
| (a) Plain cement slab, 1 cement, 2 sand       | (average of 2 slabs) | = .00630      | "      |
| F. SPECIAL METHOD, UNHARDENED                 |                      |               |        |
| (a) Slabs made to Kalman Specification        | (average of 4 slabs) | = .00370      | "      |

ENGINEERING EXPERIMENT STATION,  
OHIO STATE UNIVERSITY.

February 3rd, 1928.

Respectfully submitted,

*AJB Braden*

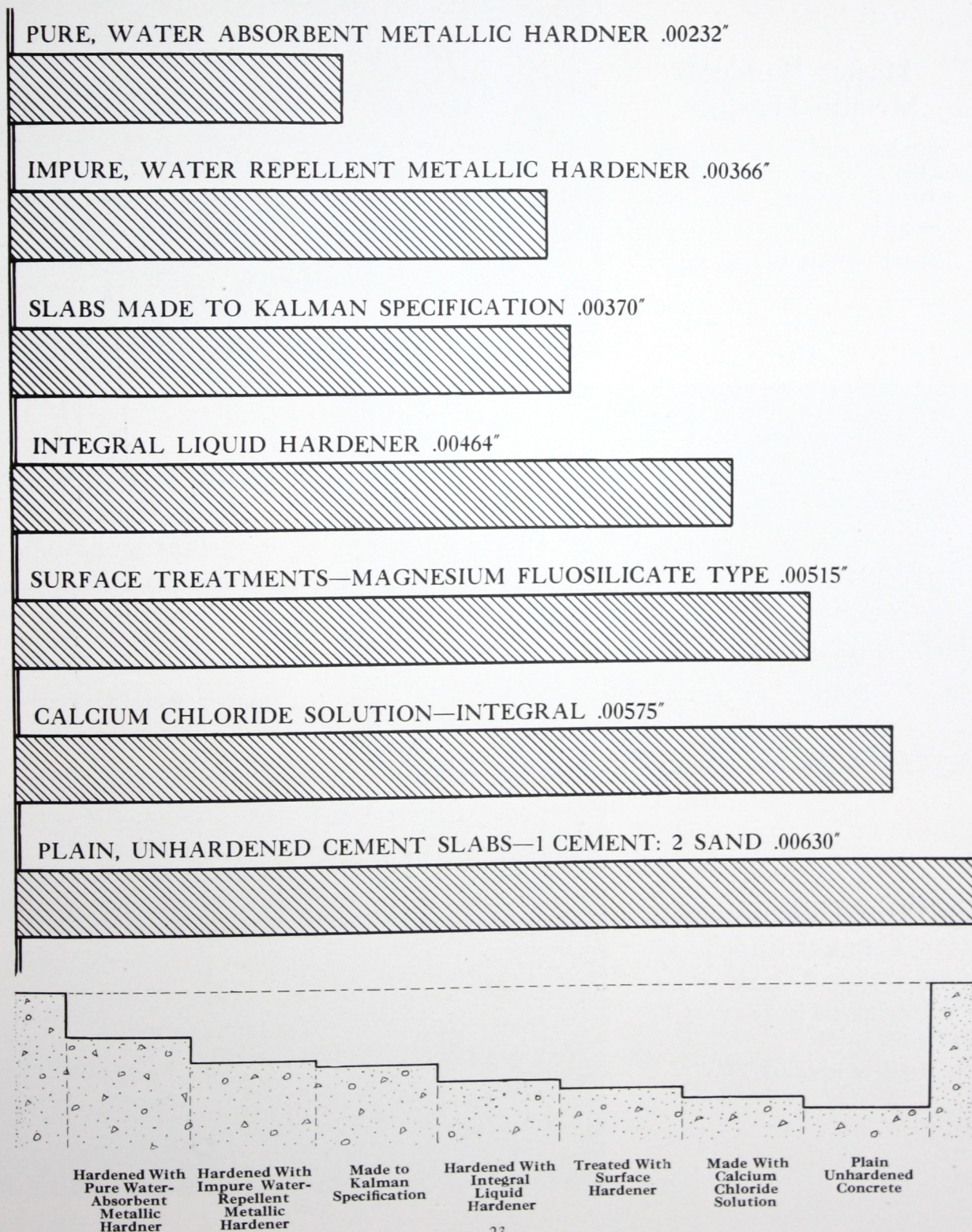
Materials Engineer.

\* Master Builders Metallic Hardner  
\*\* Master Builders Master Mix



# Graphs Showing Relative Depth of Wear Under Abrasion

—OHIO STATE UNIVERSITY TESTS—





# How Wear Actually Affects

Photographs Made Looking Down at Surfaces of Slabs

## Master Builders Metallic Hardner

See how uniformly the tough, ductile ferro-concrete finish has resisted the grinding wear. Not a break in it.

Depth of wear .00232".



## Impure Water Repel- lent Metallic Hardener

The action of foreign matter prevents proper bond, so that Metallic particles break loose. Holes in floors start this way.

Depth of wear .00366".

## Plain Unhardened Cement Finish

Note greatest depth of wear and aggregates broken away by abrasive action.

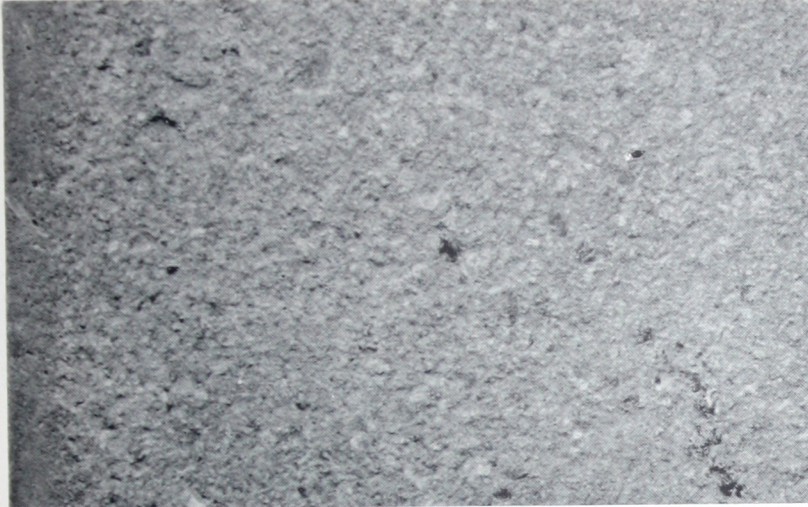
Depth of wear .00630".





# Different Concrete Finishes

Tested by Ohio State University—Enlarged 3½ Times



## Master Builders Master Mix

Note uniform resistance to wear, offered by the dense, compact surface—not a break in it after 6 hours' grinding.

Depth of wear .00389".

## Calcium Chloride Solution Used Integrally

Comparison with Master Mix slab and with plain cement slab shows wear resistance increased very little by this treatment.

Depth of wear .00575".



## Treated With Surface Hardener

Note how abrasion has worn through the thin hardened surface. Once this shell is broken this finish is no better than the plain cement slab opposite.

Depth of wear .00515".





# Will Any Metallic Hardener

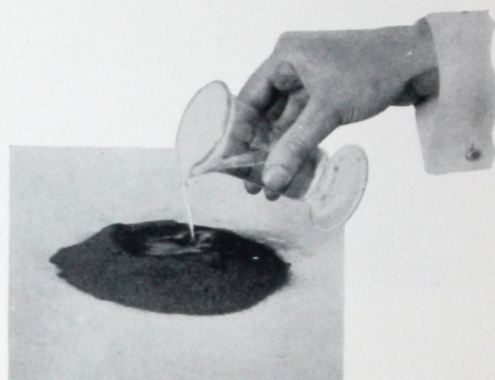
*Two hardeners which to superficial examination look*

*Good Results*—if it has these qualities:

## I. If Water Absorbent

This is of prime importance. Efficient hardener must take water instantly (see illustration) so as to mix readily into the moist mortar with a minimum of effort, and bond automatically with the cement. Unless water absorbent, troweling is made very difficult, which condition often causes scaling.

*Master Builders Metallic Hardner is Water Absorbent.*



Master Builders Hardner absorbs water.

## II. Purity

To make sure that Master Builders Concrete Hardner will contain no impurities of any kind, every pound of it is put through a special manufacturing process, exclusive with this company, to eliminate harmful oil, grease, foreign matter and foreign metals.

*Master Builders Metallic Hardner is Pure.*

## III. Properly Graded

Aggregate, either natural or Metallic, must be properly graded with the correct proportions of coarse, medium and fine particles. The grading of Master Builders Metallic Hardner from coarse to fine is scientific; its correctness is proven by nearly 20 years' experience.

*Master Builders Metallic Hardner is Properly Graded.*

## IV. Rough Jagged Particles

Every particle of an efficient Hardner must have a rough jagged shape. This enables the material to lock securely in the mixture and to offer the greatest bonding area to the cement. Special care and machinery must be used to insure this quality.

*Master Builders Metallic Hardner has rough jagged particles.*

## V. A Long Record of Successful Performance

The final test of any product is the satisfaction it gives in service. The experience of other users is, next to your own experience, your best guide. The list of Masterbuilt Floor users is a roll call of hundreds of America's leading institutions. A representative reference list will be sent upon request.



Photograph of actual concrete slab hardened with Master Builders pure Metallic Hardner which produces a perfect finish.



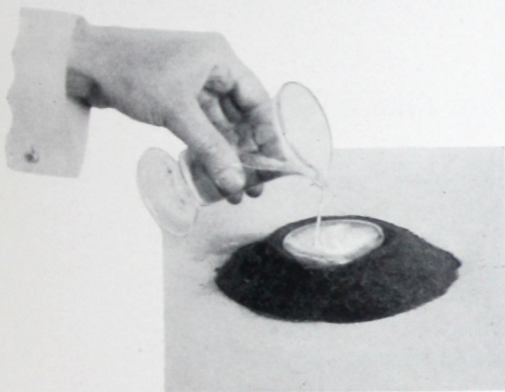
# Produce These Results?

*alike may produce very different results in a floor*

## *Bad Results*—if it has these disadvantages:

### I. If Water Repellent

If a Hardener “fights” water it is necessary to force the water into it and to force the Hardener into the floor. Results: More work and poorer work, and granulation, scaling, and dusting as a result of the additional troweling necessary.



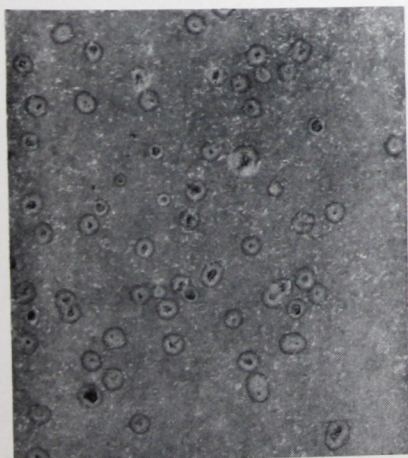
Ordinary Hardener “fights” water.

### II. Impurities

The presence in a Hardener of impurities of any nature whatsoever interferes with the chemical setting of the cement and may mean failure. The presence of oils, grease, sugary compounds, non-ferous metals—as little as an ounce in 100 pounds of Hardener, may ruin 400 square feet of floor. See case pictured on page 15.

### III. Too Coarse or Too Fine

Metallic particles too fine do not give the necessary strength or bonding surface. Too large a proportion of coarse results in a non-uniform finish with alternating soft and hard spots on the surface.



Photograph of actual concrete slab hardened with impure metallic hardener, showing the blistering caused by impurities in a hardener and which destroys wearing quality of the floor.

### IV. Smooth Rounded Particles

Smooth rounded particles present a minimum surface for bonding. Like quicksand they cannot form a strong union with the cement and consequently loosen up even under ordinary wear.

### V. An Untried Product is an Experiment

Many products are offered with the claim that they are “just as good as Master Builders.” By demanding to see performance records over years of actual use the buyer will readily find that these claims are groundless.



# Conclusions

The floor is the one part of a building that most directly affects operating efficiency, and therefore costs and profits.

The floor is the one part of a building where mistakes made in installation are most difficult if not impossible to correct.

The floor is the one part of a building where money saved beyond a reasonable first cost is most likely to be paid out later on — not once, but several times over — for maintenance and repair.

The idea that all concrete floors or concrete hardeners are alike is fallacious.

Good concrete floors, with wearing surfaces that will last 15, 18, 20 years, even under heavy present-day traffic, can be had and at moderate costs.

To secure these maximum results, you *must*:

**First** —Follow a proven specification that has been tested by years of use.

**Second** —Put *in* the floor *when it is laid* a reliable concrete hardener of the proper type for the job, to strengthen the wearing course against the action of pounding abrasive traffic.

**Third** —Know the difference between sound, efficient, quality hardeners, and unsound, imperfect “just-as-good-as” imitations. Then use nothing but the best.

**Fourth** —Employ the best workmanship — if possible, recommended specialists—to do the work. Remember, the article you are buying, a concrete floor, must be manufactured in place on the job. You have no opportunity to inspect it, test it, and accept or reject it in advance. Not until it is done and in place—too late to reject except at impractical expense—will you know what you get for your money.

Twenty years of experience has proved that the only way to be sure of getting quality concrete floors is to deal with experts whose reputation for producing quality results has been established. The Master Builders Company, originators of Concrete Hardener, have specialized in concrete wearing surfaces for approximately 20 years. In this time they have helped to develop many concrete floor experts who specialize on floor installations. Their knowledge and experience are available to you on your work, and their service is your best insurance of getting sound, long-lived floors.

Such floors will cost more to lay than ordinary floors or cheap floors. But their cost per foot per year of service will be far less.





SINCE 1910 THE SYMBOL OF  
SUCCESSFUL SPECIALIZATION IN  
CONCRETE FLOORING METHODS

*Address your inquiry to*

## **The Master Builders Company**

Main Office and Works, Cleveland, Ohio

Factories in Cleveland, O.  
Buffalo, N. Y., Irvington, N. J.

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110 Cities

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